Points of Light

DESCRIPTION
This lesson guide integrates a series of activities looking at and measuring objects in the night sky.

OBJECTIVES
Students will:

- Discuss the effect of light pollution on the number of objects visible in the night sky
- Differentiate between stars and galaxies
- Discuss the cultural implications of constellations and create a constellation myth

NASA SUMMER OF INNOVATION

UNIT
Earth and Space Science – Universe

GRADE LEVELS
7^{th} – 9^{th}

CONNECTION TO CURRICULUM
Science, Mathematics, and Technology

TEACHER PREPARATION TIME
2 hours

LESSON TIME NEEDED
4 hours *Complexity: Moderate*

NATIONAL STANDARDS

National Science Education Standards (NSTA)
Science as Inquiry
• Skills necessary to become independent inquirers about the natural world
• An appreciation of 'how we know' what we know in science

Earth and Space Science
• Earth in the Solar System
• Origin and evolution of the Universe

History and Nature of Science
• Science as a human endeavor
• History of Science
• Nature of scientific knowledge

Common Core State Standards for Mathematics (NCTM)
Statistics and probability
• Use random sampling to draw inferences about a population

ISTE NETS Performance Indicators for Students (ISTE)
Research and Information Fluency
• process data and report results

Critical Thinking, Problem Solving and Decision Making
• collect and analyze data to Identify solutions and or make informed decisions

MANAGEMENT

The Light Pollution Star Count activity must be done after dusk. Construction of the planetarium for the Stories in the Sky activity should be done and the dome tested for leaks well in advance of the activity date. Watch students for claustrophobia and anxiety issues. It is helpful to have extra adults on hand for the time in the planetarium. The Hubble Deep Field Academy requires computers with internet connection.

CONTENT RESEARCH

Study of the objects visible in the night sky has been a part of human culture since recorded history. It has only been in fairly recent years that the actual number and density of objects has come to be understood through the use of tools such as the **Hubble Space Telescope**. The human eye's ability to see all that is out there is limited by ambient light and our need to blink which inhibits long term light collection.

Key Terms

- **Constellation** – a visual grouping of stars often associated with a cultural story
- **Galaxy –** a physical grouping of stars around a common gravitational center

MATERIALS

- Scissors
- Pencils
- Pens or pins to poke holes
- Flashlight
- 4 mil black plastic sheeting 20' x 25'
- Large roll duct tape
- Large black trash bag
- Window or floor level fan
- Extension cord

Misconceptions

Many students believe that every point of light in the night sky is a star while, in truth, many of the visible objects are actually galaxies. Students may also believe that constellation members are close together when they are often separated by thousands of light years.

LESSON ACTIVITIES

The suggested sequence introduces students to counting stars by statistical sampling then progresses through to an exploration of physical and then visual groupings of stars.

Light Pollution Star Count
Students use a worksheet provided by Globe at Night to determine the level of light pollution by using observable magnitudes.
http://www.globeatnight.org/pdf/M-GaNActivityPacket_Teacher_2011_N_Leo.pdf

Counting Your Lucky Stars
Students use statistical sampling to estimate the number of stars in a portion of the sky.
http://scifiles.larc.nasa.gov/docs/guides/guide2_03.pdf

Hubble Deep Field Academy
Students use a web activity to count and classify galaxies.
http://amazing-space.stsci.edu/resources/explorations/hdf

Stories in the Sky
Students create a constellation in a portable planetarium and write a constellation myth to explain it.
http://astrobiology.nasa.gov/index.php?s=file_download&id=58

ADDITIONAL RESOURCES

Stellarium is a free, computer based planetarium program which allows for identification of stars, galaxies and constellations. http://www.stellarium.org/

DISCUSSION QUESTIONS

Each activity includes questions for discussion.
Additional questions:

- Why is NASA concerned with light pollution? *It inhibits ground based observations.*

- What can constellation stories tell us about a past culture? *They highlight the things that were important to that culture and whether they were to be feared or revered.*

ASSESSMENT ACTIVITIES

Each activity has a series of questions in the student pages.

Pretest / Posttest questions:

- What are the two types of star groupings? *Constellations, Galaxies*
- Why do we use statistical methods for counting stars and galaxies? *There are too many to count all of them.*
- What is light pollution**?** *Too much light on the ground pointed into the sky which blocks our ability to see dim stars and galaxies.*

ENRICHMENT

- Ask students to research the stories of a few common constellations identifying culture and importance.
- Have students research Edwin Hubble.
- Ask students to create a constellation and story on separate pages then mix them up and have the class try to pair them again.